

Application No. 10/083,996
Amendment dated February 24, 2005
In reply to Final Office Action of November 26, 2004

Docket No. 1232-4825

Amendments to the Claims:

Claims 1, 3-7, 9, 11-13, 18-22 and 24-30 are pending in this application. Claims 1 and 18 are independent.

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 (CURRENTLY AMENDED): An image sensing element to be used for an image sensing apparatus having an image sensing lens and a stop, and arranged to sense an image formed by the image sensing lens, the image sensing element comprising:

a plurality of microlenses; and

a plurality of light-receiving portions arranged so as to correspond to the respective microlenses,

wherein each light-receiving portions includes first, second and third light-receiving regions each outputting a signal, the third light-receiving region having first and second end portions and continuously extending from the first end portion to the second end portion along a longitudinal direction of the third light-receiving region, each of the first and second light-receiving regions having substantially symmetrical shape with respect to a line parallel to the longitudinal direction, the first and second light-receiving regions having being substantially symmetrical shape symmetry with each other and being arranged to sandwich the third light-receiving region, the width of center portions of the first and second light-receiving regions being wider than the width of center portion of the third light-receiving region, and the width of peripheral portions of the first and second light-receiving regions being narrower than the width of the peripheral portion portions of the third light receiving region.

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2 (CANCELLED):

3 (PREVIOUSLY PRESENTED): The element according to claim 1, wherein the first and second light-receiving regions are used to at least detect a focus state of the image sensing lens.

4 (PREVIOUSLY PRESENTED): The element according to claim 1, wherein the first and second light-receiving regions are used to detect a focus state of the image sensing lens and photograph an object.

5 (PREVIOUSLY PRESENTED): The element according to claim 1, wherein one of the first and second light-receiving regions receives a beam from one of two predetermined regions on a pupil of the image sensing lens and the other of the first and second light-receiving regions receives a beam from the other of the two predetermined regions on the pupil of the image sensing lens, the two predetermined regions being regions that sandwich an optical axis.

6 (PREVIOUSLY PRESENTED): The element according to claim 1, wherein the third light-receiving region is used to determine a time during which charges are accumulated in the first and second light-receiving regions.

7 (PREVIOUSLY PRESENTED): The element according to claim 1, further comprising a function of individually outputting charges accumulated in the first, second and third light-receiving regions, and a function of outputting a sum of charges accumulated in the first, second and third light-receiving regions.

8 (CANCELLED):

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9 (PREVIOUSLY PRESENTED): The element according to claim 1, wherein the third light-receiving region is narrower than a width of each of the first and second light-receiving regions at a center and wider than the width of each of the first and second light-receiving regions at two ends.

10 (CANCELLED):

11 (PREVIOUSLY PRESENTED): The element according to claim 1, wherein a region formed from the first, second and third light-receiving regions has a substantially regular polygonal shape.

12 (PREVIOUSLY PRESENTED): The element according to claim 1, wherein a region formed from the first, second and third light-receiving regions has a shape substantially obtained by cutting off each corner of a square.

13 (PREVIOUSLY PRESENTED): The element according to claim 1, wherein the microlens is arranged to cause the first and second light-receiving regions to respectively receive beams from two predetermined regions on a pupil of the image sensing lens, the two predetermined regions being regions that sandwich an optical axis.

14-17 (CANCELLED):

18 (CURRENTLY AMENDED): An image sensing apparatus comprising:
an image sensing element arranged to sense an image formed by an image sensing lens; and

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a control unit arranged to detect a focus state of the image sensing lens, and
perform focus adjustment,

wherein said image sensing element comprises:

a plurality of microlenses, and

a plurality of light-receiving portions arranged so as to correspond to the
respective microlenses, each light-receiving portion including first, second and third light-
receiving regions each outputting a signal, the third light-receiving region having first and
second end portions and continuously extending from the first end portion to the second end
portion along a longitudinal direction of the third light-receiving region, each of the first and
second light-receiving regions having substantially symmetrical shape with respect to a line
parallel to the longitudinal direction, the first and second light-receiving regions having being
substantially symmetrical shape symmetry with each other and being arranged to sandwich the
third light-receiving region, the width of center portions of the first and second light-receiving
regions being wider than the width of center portion of the third light-receiving region, and the
width of peripheral portions of the first and second light-receiving regions being narrower than
the width of the peripheral portion portions of the third light receiving region, and

wherein said control unit is arranged to detect a focus state of the image
sensing lens by using the first and second light-receiving regions.

19 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein said control
unit controls photographing operation so as to photograph an object by using the first and second
light-receiving regions.

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20 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein said control unit determines, by using the third light-receiving region, a time during which charges are accumulated in the first and second light-receiving regions.

21 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein said control unit controls a time during which charges are accumulated in the first and second light-receiving regions, in accordance with an exposure amount of the third light-receiving region in focus adjustment.

22 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein said control unit individually reads out charges accumulated in the first, second and third light-receiving regions in focus adjustment, and reads out a sum of charges accumulated in the first, second and third light-receiving regions in photography.

23 (CANCELLED):

24 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein the first and second light-receiving regions receive beams from two predetermined regions on a pupil of the image sensing lens, the two predetermined regions being regions that sandwich an optical axis.

25 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein an interval between the first and second light-receiving regions is relatively narrow at a center of the third light-receiving region and relatively wide at two ends of the third light-receiving region.

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26 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein the third light-receiving region is relatively narrow at a center and relatively wide at two ends.

27 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein the third light-receiving region is narrower than a width of each of the first and second light-receiving regions at a center, and wider than the width of each of the first and second light-receiving regions at two ends.

28 (CURRENTLY AMENDED): The apparatus according to claim 18, wherein a region formed from the first, second and third light-receiving regions has a substantially regular polygonal shape.

29 (PREVIOUSLY PRESENTED): The apparatus according to claim 18, wherein a region formed from the first, second and third light-receiving region has a shape substantially obtained by cutting off each corner of a square.

30 (ORIGINAL): An image processing apparatus comprising the image sensing apparatus defined in claim 18.

31-36 (CANCELLED):

37 (NEW): An image sensing element to be used for an image sensing apparatus having an image sensing lens and a stop, and arranged to sense an image formed by the image sensing lens, the image sensing element comprising:

a plurality of microlenses; and

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a plurality of light-receiving portions arranged so as to correspond to the respective microlenses,

wherein each light-receiving portions includes first, second and third light-receiving regions each outputting a signal, the first and second light-receiving regions having substantially symmetrical shape and being arranged to sandwich the third light-receiving region that includes a position where the principal ray of a photographing beam is incident, the width of center portions of the first and second light-receiving regions being wider than the width of center portion of the third light-receiving region, and the width of peripheral portions of the first and second light-receiving regions being narrower than the width of peripheral portion of the third light receiving region.

38 (NEW): An image sensing apparatus comprising:

an image sensing element arranged to sense an image formed by an image sensing lens; and

a control unit arranged to detect a focus state of the image sensing lens, and perform focus adjustment,

wherein said image sensing element comprises:

a plurality of microlenses, and

a plurality of light-receiving portions arranged so as to correspond to the respective microlenses, each light-receiving portion including first, second and third light-receiving regions each outputting a signal, the first and second light-receiving regions having substantially symmetrical shape and being arranged to sandwich the third light-receiving region that includes a position where the principal ray of a photographing beam is incident, the width of

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center portions of the first and second light-receiving regions being wider than the width of center portion of the third light-receiving region, and the width of peripheral portions of the first and second light-receiving regions being narrower than the width of peripheral portion of the third light receiving region, and

wherein said control unit is arranged to detect a focus state of the image sensing lens by using the first and second light-receiving regions.